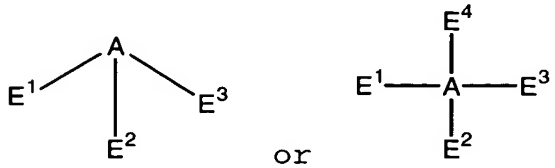
CLAIMS:

1. A polypodal chelant having the formula:



or

and pharmaceutically acceptable salts thereof, wherein A is a spacer selected from the group consisting of R^1-C, R^1-Si, R^1-Ge, N, P and P(O), or a macrocyclic group having the formula:

$$-[C(L)R^2(CR^3R^4)_a]_b-,$$

$$-[N(L)C(W)(CR^5R^6)_c]_d-,$$

$$-[OC(W)C(L)R^7(CR^8R^9)_e]_f- \text{ or}$$

$$-\{[NR^{10}C(W)C(L)R^{11}(CR^{12}R^{13})_g]_h[NR^{14}C(W)(CR^{15}R^{16})_i]_j\}-,$$

wherein a is an integer selected from 1 to 3;

b is an integer selected from 3 to 5;

c is an integer selected from 1 to 3;

d is an integer selected from 3 or 4;

e is an integer selected from 1 to 3;

f is an integer selected from 3 or 4;

g is an integer selected from 1 to 3;

h is an integer selected from 3 or 4;

i is an integer selected from 1 to 3;

j is an integer selected from 0 to 3;

L is a direct bond to E^1, E^2, E^3, and E^4;

W is H_2 or O;

R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15}, and R^{16} are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkenyl, C_1-C_6 fluoroalkenyl, benzyl, fluorobenzyl, phenyl and fluorophenyl;

E^1, E^2, E^3, and E^4 are chelating arms each independently having the formula:

$$(CR^{17}R^{18})_k\text{-}Z\text{-}X\text{-}(CR^{19}R^{20})_1NR^{21}R^{22}$$

wherein k is an integer selected from 0 to 3, provided that when A is N or $-[N(L)C(W)(CR^5R^6)_c]_d-$, k is 1-3;

l is an integer selected from 1 to 3;

Z is selected from the group consisting of a bond, O, NH, NR^1NR^1, ONH and $N(OR^1)$;

X is selected from the group consisting of C(O), $S(O)_2$ and $P(O)(OR^1)$;

R^{17}, R^{18}, R^{19}, R^{20}, R^{21} and R^{22} are independently selected from the group consisting of H, C_1-C_{10} alkyl substituted with 0-5 R^{23}, C_1-C_{10} fluoroalkyl substituted with 0-5 R^{23}, C_2-C_{10} alkenyl substituted with 0-5 R^{23}, C_2-C_{10} fluoroalkenyl substituted with 0-5 R^{23}, aryl substituted with 0-5 R^{23}, C_7-C_{16} alkaryl wherein the aryl is substituted with 0-5 R^{23}, and fluoroaryl substituted with 0-5 R^{23}; or R^{17} and R^{18}, R^{19} and R^{20} or R^{21} and R^{22} may be taken together to form a C_3-C_{10} cycloalkyl or C_3-C_{10} cycloalkenyl optionally interrupted with C(O)NH, NH,

NHC(O), NHC(O)NH, NHC(S)NH, O, S, S(O), $S(O)_2$, $P(O)(OR^{24})$, $P(O)(OR^{24})O$ or $P(O)(NHR^{24})O$, or to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkenyl, benzyl, fluorobenzyl, phenyl, and fluorophenyl.

2. A polypodal chelant according to claim 1, characterized by having four chelating arms.

3. A polypodal chelant according to claim 1, characterized by being tripodal.

4. A tripodal chelant according to claim 3, wherein A is a spacer selected from the group consisting of R^1-C, N, P, P(O), and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^1, R^5, and R^6 are selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl, and phenyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

R^{21} and R^{22} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-2 R^{23}, C_2-C_{10} alkenyl substituted with 0-2 R^{23}, aryl substituted with 0-2 R^{23}, and C_7-C_{16}

alkaryl, wherein the aryl is substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl and phenyl.

5. A tripodal chelant according to claim 4, wherein A is a spacer selected from the group consisting of N, P(O), and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^5 and R^6 are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, phenyl and benzyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein R^{21} and R^{22} are independently selected from the group consisting of C_1-C_{10} alkyl substituted with 0-2 R^{23}, and aryl substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23}; R^{23} is selected from the group consisting of OH, C_1-C_3 hydroxyalkyl, COOH, $PO(OH)_2$ and $S(O)_2OH$.

6. A tripodal chelant according to claim 5, wherein A is a spacer selected from the group consisting of N, and P(O); E^1, E^2 and E^3 are chelating arms each independently having the formula:

$(CH_2)_k$-$NHCOCH_2NR^{21}R^{22}$

wherein k is 2-3; R^{21} is independently selected from the group consisting of CH_3, CH_2COOH, and $CH_2PO(OH)_2$; and R^{22} is independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

7. A tripodal chelant according to claim 6, wherein A is N or P(O); E^1, E^2, and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

8. A tripodal chelant according to claim 7, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

9. A tripodal chelant according to claim 7, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_3)(CH_2COOH)$, and k is 2-3.

10. A tripodal chelant according to claim 7, wherein A is N; E^1, E^2, and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 2-hydroxyphenyl.

11. A tripodal chelant according to claim 7, wherein A is N; E^1, E^2, and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 4-(2-methyl-3-hydroxy-5-hydroxymethyl)pyridyl.

12. A tripodal chelant according to claim 5, wherein A is $-[N(L)-CH_2CH_2-]_3-$; and E^1, E^2, and E^3 are chelating arms each independently having the formula:

$COCH_2NR^{21}R^{22}$.

13. A tripodal chelant according to claim 12, wherein A is $-[N(L)-CH_2CH_2-]_3-$; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$COCH_2NR^{21}R^{22}$

wherein R^{21} and R^{22} are independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

14. A tripodal chelant according to claim 13, wherein A is $-[N(L)-CH_2CH_2-]_3-$; and E^1, E^2, and E^3 are $COCH_2N(CH_2COOH)_2$.

15. A radiopharmaceutical compound comprising a polypodal chelant according to claim 1, chelated with a radionuclide selected from the group consisting of ^{52m}Mn, ^{52}Fe, ^{55}Co, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{90}Y, ^{94m}Tc, ^{99m}Tc, ^{105}Rh, ^{109}Pd, ^{111}In, ^{117m}Sn, ^{149}Pr, ^{153}Sm, ^{159}Gd, ^{166}Ho, ^{169}Yb, ^{177}Lu, ^{186}Re, ^{188}Re, ^{203}Pb, ^{211}Pb, and ^{212}Bi.

16. The radiopharmaceutical compound according to claim 15, wherein said polypodal chelant is characterized by having four chelating arms.

17. The radiopharmaceutical compound according to claim 15, wherein said polypodal chelant is characterized by being tripodal.

18. The radiopharmaceutical compound according to claim 17, wherein A of said tripodal chelant is a spacer selected from the group consisting of R^1-C, N, P, P(O), and

$-[N(L)C(W)(CR^5R^6)_c]_d-$; R^1, R^5, and R^6 are selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl, and phenyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

R^{21} and R^{22} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-2 R^{23}, C_2-C_{10} alkenyl substituted with 0-2 R^{23}, aryl substituted with 0-2 R^{23}, and C_7-C_{16} alkaryl, wherein the aryl is substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a $=CH-R^{22a}$ group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl and phenyl.

19. The radiopharmaceutical compound according to claim 18, wherein A is a spacer selected from the group consisting of N, P(O), and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^5 and R^6 are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6

cycloalkyl, phenyl and benzyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

wherein R^{21} and R^{22} are independently selected from the group consisting of C_1-C_{10} alkyl substituted with 0-2 R^{23}, and aryl substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a $=CH\text{-}R^{22a}$ group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23}; R^{23} is selected from the group consisting of OH, C_1-C_3 hydroxyalkyl, COOH, $PO(OH)_2$ and $S(O)_2OH$.

20. The radiopharmaceutical compound according to claim 19, wherein A is N or P(O); E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

wherein k is 2-3; R^{21} is independently selected from the group consisting of CH_3, CH_2COOH, and $CH_2PO(OH)_2$; and R^{22} is independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

21. The radiopharmaceutical compound according to claim 20, wherein A is N or P(O); k is 2-3; and E^1, E^2 and E^3 are

$$(CH_2)_k\text{-}NHCOCH_2N(CH_2COOH)_2.$$

22. The radiopharmaceutical compound according to claim 21, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

23. The radiopharmaceutical compound according to claim 21, wherein A is N; k is 2-3; and E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_3)(CH_2COOH)$.

24. The radiopharmaceutical compound according to claim 21, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N=CH-R^{22a}$, k is 2-3, and R^{22a} is 2-hydroxyphenyl.

25. The radiopharmaceutical compound according to claim 21, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N=CH-R^{22a}$, k is 2-3, and R^{22a} is 4-(2-methyl-3-hydroxy-5-hydroxymethyl)pyridyl.

26. The radiopharmaceutical compound according to claim 19, wherein A is $-[N(L)-CH_2CH_2-]_3-$; and E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$COCH_2NR^{21}R^{22}.$$

27. An MRI contrast agent comprising a polypodal chelant according to claim 1, chelated with a paramagnetic metal ion of atomic number 21-29, 42-44 or 58-70.

28. The MRI contrast agent according to claim 27, wherein said polypodal chelant is characterized by having four chelating arms.

29. The MRI contrast agent according to claim 28, wherein said polypodal chelant is characterized by being tripodal.

30. The MRI contrast agent according to claim 29, wherein A of said tripodal chelant is a spacer selected from the group consisting of R^1-C, N, P, P(O), and -$[N(L)C(W)(CR^5R^6)_c]_d$-; R^1, R^5, and R^6 are selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl, and phenyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

R^{21} and R^{22} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-2 R^{23}, C_2-C_{10} alkenyl substituted with 0-2 R^{23}, aryl sub-stituted with 0-2 R^{23}, and C_7-C_{16} alkaryl, wherein the aryl is substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}{}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl and phenyl.

31. The MRI contrast agent according to claim 30, wherein A is a spacer selected from the group consisting

of N, P(O), and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^5 and R^6 are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, phenyl and benzyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein R^{21} and R^{22} are independently selected from the group consisting of C_1-C_{10} alkyl substituted with 0-2 R^{23}, and aryl substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a $=CH-R^{22a}$ group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23}; R^{23} is selected from the group consisting of OH, C_1-C_3 hydroxyalkyl, COOH, $PO(OH)_2$ and $S(O)_2OH$.

32. The MRI contrast agent according to claim 31, wherein A is N or P(O); E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein k is 2-3; R^{21} is independently selected from the group consisting of CH_3, CH_2COOH, and $CH_2PO(OH)_2$; and R^{22} is independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

33. The MRI contrast agent according to claim 32, wherein A is N or P(O); k is 2-3; and E^1, E^2 and E^3 are

$$(CH_2)_k-NHCOCH_2N(CH_2COOH)_2.$$

34. The MRI contrast agent according to claim 33, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

35. The MRI contrast agent according to claim 33, wherein A is N; k is 2-3; and E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_3)(CH_2COOH)$.

36. The MRI contrast agent according to claim 33, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 2-hydroxyphenyl.

37. The MRI contrast agent according to claim 33, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 4-(2-methyl-3-hydroxy-5-hydroxymethyl) pyridyl.

38. The MRI contrast agent according to claim 31, wherein A is $-[N(L)-CH_2CH_2-]_3-$; and E^1, E^2 and E^3 are chelating arms each independently having the formula $COCH_2NR^{21}R^{22}$.

39. An X-ray or CT contrast agent comprising a polypodal chelant according to claim 1, chelated with a heavy metal ion of atomic number 21-31, 39-50, 56-80, 82, 83 or 90.

40. The X-ray or CT contrast agent according to claim 39, wherein said polypodal chelant is characterized by having four chelating arms.

41. The X-ray or CT contrast agent according to claim 40, wherein said polypodal chelant is characterized by being tripodal.

42. The X-ray or CT contrast agent according to claim 41, wherein A of said tripodal chelant is a spacer selected from the group consisting of R^1-C, N, P, P(O), and

$-[N(L)C(W)(CR^5R^6)_c]_d-$; R^1, R^5, and R^6 are selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl, and phenyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

R^{21} and R^{22} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-2 R^{23}, C_2-C_{10} alkenyl substituted with 0-2 R^{23}, aryl sub-stituted with 0-2 R^{23}, and C_7-C_{16} alkaryl, wherein the aryl is substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a $=CH-R^{22a}$ group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl and phenyl.

43. The X-ray or CT contrast agent according to claim 42, wherein A is a spacer selected from the group consisting of N, P(O), and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^5 and R^6 are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, phenyl and benzyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein R^{21} and R^{22} are independently selected from the group consisting of C_1-C_{10} alkyl substituted with 0-2 R^{23}, and aryl substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a $=CH-R^{22a}$ group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23}; R^{23} is selected from the group consisting of OH, C_1-C_3 hydroxyalkyl, COOH, $PO(OH)_2$ and $S(O)_2OH$.

44. The X-ray or CT contrast agent according to claim 43, wherein A is N or P(O); E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein k is 2-3; R^{21} is independently selected from the group consisting of CH_3, CH_2COOH, and $CH_2PO(OH)_2$; and R^{22} is independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

45. The X-ray or CT contrast agent according to claim 44, wherein A is N or P(O); k is 2-3; and E^1, E^2 and E^3 are

$$(CH_2)_k\text{-}NHCOCH_2N(CH_2COOH)_2.$$

46. The X-ray or CT contrast agent according to claim 45, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

47. The X-ray or CT contrast agent according to claim 45, wherein A is N; k is 2-3; and E^1, E^2 and E^3 are

$$(CH_2)_k\text{-}NHCOCH_2N(CH_3)(CH_2COOH).$$

48. The X-ray or CT contrast agent according to claim 45, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH\text{-}R^{22a}$, k is 2-3, and R^{22a} is 2-hydroxyphenyl.

49. The X-ray or CT contrast agent according to claim 45, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH\text{-}R^{22a}$, k is 2-3, and R^{22a} is 4-(2-methyl-3-hydroxy-5-hydroxy-methyl)pyridyl.

50. The X-ray or CT contrast agent according to claim 43, wherein A is $-[N(L)\text{-}CH_2CH_2\text{-}]_3\text{-}$; and E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$COCH_2NR^{21}R^{22}.$$

51. A conjugate of the formula:

$$BFC\text{-}L_n\text{-}BM,$$

and pharmaceutically acceptable salts thereof,

wherein BFC is a polypodal chelant according to claim 1, in which one of R^1 to R^{24} includes a bond to L_n;

L_n is a linking group of formula:

$$L^1-[Y^1(CR^{25}R^{26})_f(Z^1)_{f"}Y^2]_{f'}-L^2,$$

L^1 is $-[(CH_2)_gZ^1]_{g'}-(CR^{25}R^{26})_{g"}-$;

L^2 is $-(CR^{25}R^{26})_{g"}-[Z^1(CH_2)_g]_{g'}-$;

g is independently 0-10;

g' is independently 0-1;

g" is independently 0-10;

f is independently 0-10;

f' is independently 0-10;

f" is independently 0-1;

Y^1 and Y^2, at each occurrence, are independently selected from the group consisting of a bond, O, NR^{26}, C=O, C(=O)O, OC(=O)O, C(=O)NH-, $C=NR^{26}$, S, S(O), $S(O)_2$, NHC(=O), $(NH)_2C(=O)$ and $(NH)_2C=S$;

R^{25} and R^{26} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-5 R^{27} and alkaryl wherein the aryl is substituted with 0-5 R^{27};

R^{27} is independently selected at each occurrence from the group consisting of NHR^{28}, $C(=O)R^{28}$, $OC(=O)R^{28}$, $OC(=O)OR^{28}$, $C(=O)OR^{28}$, $C(=O)NR_2^{28}$, -CN, SR^{28}, $S(O)R^{28}$, $S(O)_2R^{28}$, $NHC(=O)R^{28}$, $NHC(=O)NHR^{28}$, $NHC(=S)NHR^{28}$ and a bond to BM;

R^{28} is independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, benzyl, phenyl and a bond to BM; and

BM is a biologically active molecule selected from the group consisting of IIb/IIIa receptor ligands, fibrin binding peptides, leukocyte binding peptides, chemotactic peptides, LTB_4 receptor antagonists, somatostatin analogs, selectin binding peptides, vitronectin receptor antagonists, tyrosine kinase inhibitors, matrix metalloproteinase inhibitors, oligonucleotides, fatty acids, nitroimidazoles, and carbohydrates.

52. A conjugate according to claim 51, wherein said polypodal chelant is characterized by having four chelating arms.

53. A conjugate according to claim 51, wherein said polypodal chelant is characterized by being tripodal.

54. A conjugate according to claim 53, wherein A of said tripodal chelant is a spacer selected from the group consisting of R^1-C, N, P, P(O), and -$[N(L)C(W)(CR^5R^6)_c]_d$-; R^1, R^5, and R^6 are selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl, and phenyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

R^{21} and R^{22} are independently selected at each occurrence from the group consisting of H, C_1-C_{10} alkyl substituted with 0-2 R^{23}, C_2-C_{10} alkenyl substituted with 0-2 R^{23}, aryl sub-stituted with 0-2 R^{23}, and C_7-C_{16} alkaryl, wherein the aryl is substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, $C(=O)R^{24}$, $C(=O)OR^{24}$, $C(=O)NR^{24}{}_2$, $PO(OR^{24})_2$ and $S(O)_2OR^{24}$; and

R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, benzyl and phenyl.

55. A conjugate according to claim 54, wherein A is a spacer selected from the group consisting of N, P(O) and $-[N(L)C(W)(CR^5R^6)_c]_d-$; R^5 and R^6 are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, phenyl and benzyl; E^1, E^2, and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k-NHCOCH_2NR^{21}R^{22}$$

wherein R^{21} and R^{22} are independently selected from the group consisting of C_1-C_{10} alkyl substituted with 0-2 R^{23}, and aryl substituted with 0-2 R^{23}, or R^{21} and R^{22} may be taken together to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23}, or heterocycle substituted by 0-5 R^{23}; R^{23} is selected from the group consisting of OH, C_1-C_3 hydroxyalkyl, COOH, $PO(OH)_2$ and $S(O)_2OH$.

56. A conjugate according to claim 55, wherein A is N or P(O); E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$(CH_2)_k\text{-}NHCOCH_2NR^{21}R^{22}$$

wherein k is 2-3; R^{21} is independently selected from the group consisting of CH_3, CH_2COOH, and $CH_2PO(OH)_2$; and R^{22} is independently selected from the group consisting of CH_2COOH, and $CH_2PO(OH)_2$.

57. A conjugate according to claim 56, wherein A is N or P(O); E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

58. A conjugate according to claim 57, wherein A is N; E^1, E^2, and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_2COOH)_2$, and k is 2-3.

59. A conjugate according to claim 57, wherein A is N; E^1, E^2, and E^3 are $(CH_2)_k$-$NHCOCH_2N(CH_3)(CH_2COOH)$, and k is 2-3.

60. A conjugate according to claim 57, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 2-hydroxyphenyl.

61. A conjugate according to claim 57, wherein A is N; E^1, E^2 and E^3 are $(CH_2)_k$-$NHCOCH_2N{=}CH$-R^{22a}, k is 2-3, and R^{22a} is 4-(2-methyl-3-hydroxy-5-hydroxymethyl)pyridyl.

62. A conjugate according to claim 55, wherein A is $-[N(L)-CH_2CH_2-]_3-$; and E^1, E^2 and E^3 are chelating arms each independently having the formula:

$$COCH_2NR^{21}R^{22}.$$

63. A radiopharmaceutical compound comprising a conjugate according to claim 51, chelated with a radionuclide selected from the group consisting of ^{52m}Mn, ^{52}Fe, ^{55}Co, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{90}Y, ^{94m}Tc, ^{99m}Tc, ^{105}Rh, ^{109}Pd, ^{111}In, ^{117m}Sn, ^{149}Pr, ^{153}Sm, ^{159}Gd, ^{166}Ho, ^{169}Yb, ^{177}Lu, ^{186}Re, ^{188}Re, ^{203}Pb, ^{211}Pb, and ^{212}Bi.

64. An MRI contrast agent comprising a conjugate according to claim 51, chelated with a paramagnetic metal ion of atomic number 21-29, 42-44 or 58-70.

65. An X-ray or CT contrast agent comprising a conjugate according to claim 51, chelated with a heavy metal ion of atomic number 21-31, 39-50, 56-80, 82, 83 or 90.

66. A radiopharmaceutical composition for treating pathological processes involving angiogenic neovasculature in a patient in need thereof comprising a therapeutically effective amount of the radiopharmaceutical compound of claim 15 and a pharmaceutically acceptable carrier.

67. The composition of claim 66, wherein said radiopharmaceutical compound comprises a beta, alpha or Auger electron-emitting isotope.

68. A method for treating pathological processes involving angiogenic neovasculature in a patient in need thereof comprising administering to said patient a therapeutically effective amount of the radiopharmaceutical composition of claim 66.

69. A composition for radioactive imaging comprising an effective amount of the radiopharmaceutical compound of claim 15 and a pharmaceutically acceptable carrier.

70. A method for radioactive imaging comprising administering to a patient to be imaged sufficiently in advance thereto an effective amount of the radioactive imaging composition of claim 69.

71. A method according to claim 70, wherein said imaging method is gamma scintigraphy or positron-emission tomography.

72. A composition for X-ray imaging comprising an effective amount of the contrast agent of claim 39 and a pharmaceutically acceptable carrier.

73. A method for X-ray imaging comprising administering to a patient to be imaged sufficiently in advance thereof an effective amount of the X-ray imaging composition of claim 72.

74. A method according to claim 73, wherein said X-ray imaging method is CT imaging.

75. A composition for magnetic resonance imaging comprising an effective amount of the contrast agent of claim 27 and a pharmaceutically acceptable carrier.

76. A method for magnetic resonance imaging comprising administering to a patient to be imaged sufficiently in advance thereof an effective amount of the magnetic resonance imaging composition of claim 75.

77. A pharmaceutical composition for treating heavy metal toxicity in a patient in need thereof, comprising a therapeutically effective amount of the polypodal chelant of claim 1 and a pharmaceutically acceptable carrier.

78. A method for treating heavy metal toxicity in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of the pharmaceutical composition of claim 77.

79. A radiopharmaceutical treatment kit comprising: a sterile, non-pyrogenic formulation comprising a radiopharmaceutical composition according to claim 66, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

solubilization aids, bacteriostats and equipment for administering said composition.

80. The treatment kit of claim 79, wherein said formulation is in the form of a sterile solution or lyophilized solid.

81. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising a radiopharmaceutical composition according to claim 66, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

82. The diagnostic kit of claim 81, wherein said formulation is in the form of a sterile solution or lyophilized solid.

83. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising an X-ray imaging composition according to claim 72, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

84. The diagnostic kit of claim 83, wherein said formulation is in the form of a sterile solution or lyophilized solid.

85. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising a magnetic resonance imaging composition according to claim 75, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

86. The diagnostic kit of claim 85, wherein said formulation is in the form of a sterile solution or lyophilized solid.

87. A compound having the formula:

$$A[(CR^{17}R^{18})_kNH_2]_m$$

wherein A is a spacer selected from the group consisting of R^1-C, R^1-Si, R^1-Ge, N, P and P(O), or a macrocyclic group having the formula:

$$-[C(L)R^2(CR^3R^4)_a]_b-,$$

$$-[N(L)C(W)(CR^5R^6)_c]_d-,$$

$$-[OC(W)C(L)R^7(CR^8R^9)_e]_f- \text{ or}$$

$$-\{[NR^{10}C(W)C(L)R^{11}(CR^{12}R^{13})_g]_h[NR^{14}C(W)(CR^{15}R^{16})_i]_j\}-,$$

wherein a is an integer selected from 1 to 3;

b is an integer selected from 3 to 5;

c is an integer selected from 1 to 3;

d is an integer selected from 3 or 4;

e is an integer selected from 1 to 3;

f is an integer selected from 3 or 4;

g is an integer selected from 1 to 3;

h is an integer selected from 3 or 4;

i is an integer selected from 1 to 3;

j is an integer selected from 0 to 3;

k is an integer selected from 0 to 3;

m is an integer selected from 3 or 4;

L is a direct bond to $[(CR^{17}R^{18})_kNH_2]$;

W is H_2 or O;

R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13}, R^{14}, R^{15}, and R^{16} are independently selected at each occurrence from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkenyl, C_1-C_6 fluoroalkenyl, benzyl, fluorobenzyl, phenyl and fluorophenyl;

R^{17} and R^{18} are independently selected from the group consisting of H, C_1-C_{10} alkyl substituted with 0-5 R^{23},

C_1-C_{10} fluoroalkyl substituted with 0-5 R^{23}, C_2-C_{10} alkenyl substituted with 0-5 R^{23}, C_2-C_{10} fluoroalkenyl substituted with 0-5 R^{23}, aryl substituted with 0-5 R^{23}, C_7-C_{16} alkaryl wherein the aryl is substituted with 0-5 R^{23}, and fluoroaryl substituted with 0-5 R^{23}; or R^{17} and R^{18} may be taken together to form a C_3-C_{10} cycloalkyl or C_3-C_{10} cycloalkenyl optionally interrupted with C(O)NH, NH, NHC(O), NHC(O)NH, NHC(S)NH, O, S, S(O), $S(O)_2$, P(O)(OR^{24}), P(O)(OR^{24})O or P(O)(NHR^{24})O, or to form a =CH-R^{22a} group, wherein R^{22a} is aryl substituted with 0-5 R^{23} or heterocycle substituted by 0-5 R^{23};

R^{23} is selected from the group consisting of H, OH, C_1-C_3 alkyl, C_1-C_3 hydroxyalkyl, C(=O)R^{24}, C(=O)OR^{24}, C(=O)NR^{24}_2, PO(OR^{24})$_2$ and $S(O)_2OR^{24}$; and

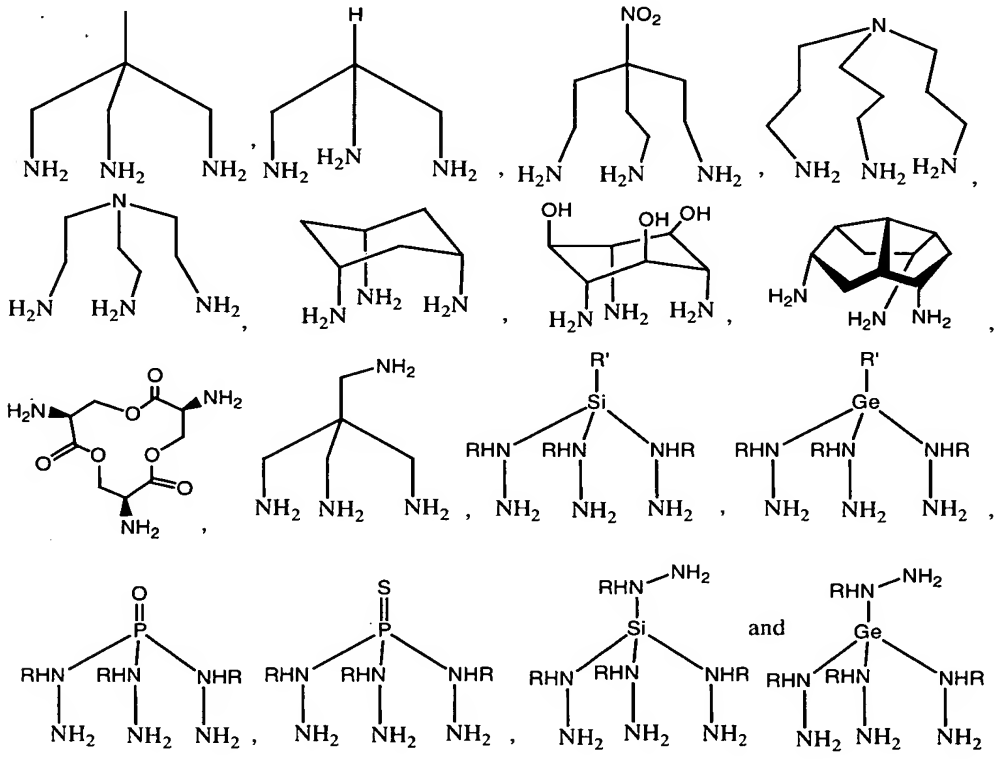
R^{24} is selected from the group consisting of H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkyl, C_1-C_6 alkenyl, C_3-C_6 cycloalkyl, C_1-C_6 fluoroalkenyl, benzyl, fluorobenzyl, phenyl, and fluorophenyl.

88. A compound according to claim 60, wherein m is 4.

89. A compound according to claim 60, wherein m is 3.

90. A compound according to claim 62, wherein A is N or $-[N(L)-C_2H_5]_3-$; k is 0, 2 or 3; and R^{17} and R^{18} are H.

91. A compound according to claim 89, which is selected from the group consisting of:



92. A radiopharmaceutical composition for treating pathological processes involving angiogenic neovasculature in a patient in need thereof comprising a therapeutically effective amount of the radiopharmaceutical compound of claim 63 and a pharmaceutically acceptable carrier.

93. The composition of claim 92, wherein said radiopharmaceutical compound comprises a beta, alpha or Auger electron-emitting isotope.

94. A method for treating pathological processes involving angiogenic neovasculature in a patient in need thereof comprising administering to said patient a therapeutically effective amount of the radiopharmaceutical composition of claim 92.

95. A composition for radioactive imaging comprising an effective amount of the radiopharmaceutical compound of claim 63 and a pharmaceutically acceptable carrier.

96. A method for radioactive imaging comprising administering to a patient to be imaged sufficiently in advance thereto an effective amount of the radioactive imaging composition of claim 95.

97. A method according to claim 96, wherein said imaging method is gamma scintigraphy or positron-emission tomography.

98. A composition for X-ray imaging comprising an effective amount of the contrast agent of claim 65 and a pharmaceutically acceptable carrier.

99. A method for X-ray imaging comprising administering to a patient to be imaged sufficiently in advance thereof an effective amount of the X-ray imaging composition of claim 98.

100. A method according to claim 99, wherein said X-ray imaging method is CT imaging.

101. A composition for magnetic resonance imaging comprising an effective amount of the contrast agent of claim 64 and a pharmaceutically acceptable carrier.

102. A method for magnetic resonance imaging comprising administering to a patient to be imaged sufficiently in advance thereof an effective amount of the magnetic resonance imaging composition of claim 101.

103. A radiopharmaceutical treatment kit comprising: a sterile, non-pyrogenic formulation comprising a radiopharmaceutical composition according to claim 92, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

104. The treatment kit of claim 103, wherein said formulation is in the form of a sterile solution or lyophilized solid.

105. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising a radiopharmaceutical composition according to claim 92, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

106. The diagnostic kit of claim 105, wherein said formulation is in the form of a sterile solution or lyophilized solid.

107. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising an X-ray imaging composition according to claim 98, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

108. The diagnostic kit of claim 107, wherein said formulation is in the form of a sterile solution or lyophilized solid.

109. A diagnostic kit comprising: a sterile, non-pyrogenic formulation comprising a magnetic resonance imaging composition according to claim 101, a pH 3-9 buffering agent and optionally one or more additives selected from the group consisting of ancillary ligands, reducing agents, transfer ligands, buffers, lyophilization aids, stabilization aids, solubilization aids, bacteriostats and equipment for administering said composition.

110. The diagnostic kit of claim 109, wherein said formulation is in the form of a sterile solution or lyophilized solid.